Study plan

Name of study plan: Bachelor Specialization Computer Systems and Virtualization, 2021

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Informatics Type of study: Bachelor full-time Required credits: 155 Elective courses credits: 25 Sum of credits in the plan: 180 Note on the plan: This version of the study plan is intended for students who have been enrolled for study from the academic year 2021/2022 into the full-time form of study of the bachelor's program. . Guarantor: prof. Ing. Pavel Tvrdík, CSc., email: pavel.tvrdik@fit.cvut.cz Name of the block: Compulsory courses in the program Minimal number of credits of the block: 110 The role of the block: PP Code of the group: BIE-PP.21 Name of the group: Compulsory Courses of Bachelor Study Program Informatics, version 2021 Requirement credits in the group: In this group you have to gain 110 credits Requirement courses in the group: In this group you have to complete 21 courses Credits in the group: 110

Note on the group: If you plan to profile yourself in the specialization Information Security, Computer Networks and Internet, Computer Systems and Virtualization, or Software Engineering, enroll in the course BIE-PSI.21 in your 2nd semester of study. If you plan to profile yourself in the specialization Computer Engineering, or Computer Science, enroll in the course BI-PSI.21 in your 4th semester of study. - On the basis of the certificate of knowledge of English at the B2 level, which is stated in the conditions for admission to study, you can have the subject BIE-EEC recognized for 4 credits.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-AG1.21	Algorithms and Graphs 1 Tomáš Valla, Michal Opler, Ji ina Scholtzová, Dušan Knop, Maria Saumell Mendiola Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-AAG.21	Automata and Grammars Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-BPR.21	Bachelor Project Zden k Muziká Zden k Muziká (Gar.)	Z	1		Z,L	PP
BIE-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BIE-PSI.21	Computer Networks Yelena Trofimova, Michal Polák Yelena Trofimova Yelena Trofimova (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-SAP.21	Computer Structures and Architectures Petr Fišer, Hana Kubátová Petr Fišer Petr Fišer (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BIE-KAB.21	Cryptography and Security Ji í Bu ek, Martin Jure ek, Filip Kodýtek, Josef Kokeš, Jaroslav K íž, Róbert Lórencz, Ivana Trummová, František Ková, David Pokorný Ji í Bu ek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BIE-DBS.21	Database Systems Josef Pavlí ek, Otto Šleger, Martin Urbanec Josef Pavlí ek Josef Pavlí ek (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BIE-DML.21	Discrete Mathematics and Logic Eva Pernecká, Jitka Rybní ková, Francesco Dolce Eva Pernecká Eva Pernecká (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-TDP.21	Documentation and Presentation Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP

BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PP
BIE-LA1.21	Linear Algebra 1 Marzieh Forough Karel Klouda Marzieh Forough (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BIE-MA1.21	Mathematical Analysis 1 Antonella Marchesiello Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BIE-MA2.21	Mathematical Analysis 2 Antonella Marchesiello Tomáš Kalvoda Antonella Marchesiello (Gar.)	Z,ZK	6	3P+2C	Z	PP
BIE-OSY.21	Operating Systems Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BIE-PST.21	Probability and Statistics Francesco Dolce Pavel Hrabák Francesco Dolce (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-PA1.21	Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BIE-PA2.21	Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Ladislav Vagner, Josef Vogel Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BIE-GIT.21	SW Development Technologies Petr Pulc Petr Pulc (Gar.)	Z	3	2P	Z	PP
BIE-TZP.21	Technological Fundamentals of Computers Kate ina Hyniová, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BIE-UOS.21	Unix-like Operating Systems Jan Trdli ka, Jakub Žitný, Zden k Muziká Zden k Muziká (Gar.)	KZ	5	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=BIE-PP.21 Name=Compulsory Courses of Bachelor Study Program Informatics, version 2021

BIE-AG1.21 Algorithms and Graphs 1	Z,ZK	5				
The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computed on the core knowledge on the core knowl	uting curriculum. If	t is interlinked				
with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity	of algorithms and	d learn to handle				
practically the asymptotic mathematics.						
BIE-AAG.21 Automata and Grammars	Z,ZK	5				
Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of fin	ite automata, reg	ular expressions				
and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between formal languages and automata.						
Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translatio	n, and design of c	ligital circuits.				
BIE-BPR.21 Bachelor Project	Z	1				
At the beginning of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that	student will perfo	rm during the				
semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.						
BIE-BAP.21 Bachelor Thesis	Z	14				
BIE-PSI.21 Computer Networks	Z,ZK	5				
The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in loc	al networks and i	n the Internet as				
well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network	work technologies	. Students				
practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS	à.					
BIE-SAP.21 Computer Structures and Architectures	Z,ZK	5				
Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, in	nputs, outputs, da	ta storage and				
transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital de	əsign tools.					
BIE-KAB.21 Cryptography and Security	Z,ZK	5				
Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to	o use cryptograph	nic keys and				
certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in a	pplications. Withir	n labs, students				
will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedure:	s of cryptanalysis	Students are				
expected to be competent programmers in C/C++ (on a small scale). Basic Python knowledge is an advantage.						
BIE-DBS.21 Database Systems	Z,ZK	5				
Students get acquainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data stor	e (including integr	rity constraints)				
using a conceptual model and then implement them in a relational database engine. They get acquainted with the SQL language and also with its the	oretical basis - rela	ational database				
model. They will get acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction a	processing and co	ontrol of parallel				
user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database models.						
BIE-DML.21 Discrete Mathematics and Logic	Z,ZK	5				
Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts	from set theory w	vill be explained.				
Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The co	ourse also lays do	wn the basics of				
combinatorics and number theory, with emphasis on modular arithmetics.						
BIE-TDP.21 Documentation and Presentation	KZ	3				
The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typical	ly final university t	heses. Students				
learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically pr	esent it in front of	classmates and				
the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the						
exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.						
BIE-EEC English language external certificate	Z	4				
The BIE-ECC course can be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in E	nglish comparable	e to or exceeding				
the B2 level of the Common European Framework of Reference for Languages.						

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BIE-LA1.21 Linear Algebra 1	Z,ZK	5
We will introduce students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the fit	eld of real and cor	nplex numbers
and also over finite fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian ell	mination method (GEM) and show
the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eige	invalues and eiger	ivectors of a
matrix. We will also demonstrate some applications of these concepts in computer science.		
BIE-MA1.21 Mathematical Analysis 1	Z,ZK	5
We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine number	ers. Then we study	real sequences
and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of fu	nctions. This theor	etical foundation
is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation	and solution of sin	nple optimization
problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical desc	cription of complex	ity of algorithms.
BIE-MA2.21 Mathematical Analysis 2	Z,ZK	6
The course completes the theme of analysis of real functions of a real variable initiated in BIE-MA1 by introducing the Riemann integral. Students w	ill learn how to int	egrate by parts
and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem	n to the computation	on of elementary
functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms	s, and its analysis	using the Master
theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and	l Hessian matrix, v	ve study the
analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the in	ntegration of multiv	variate functions.
BIE-OSY.21 Operating Systems	Z,ZK	5
In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread	implementations,	race conditions,
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS r	nonitoring. They a	re able to design
and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows.		
BIE-PST.21 Probability and Statistics	Z,ZK	5
Students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variable	es. They will be ab	le to apply basic
models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction	they will be able t	o perform
estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods for testing statist	ical hypotheses ar	nd determining
the statistical dependence of two or more random variables.		
BIE-PA1.21 Programming and Algorithmics 1	Z,ZK	7
Students learn to construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, struct	ured), expression	s, statements,
and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundament	ntal algorithms for	searching,
sorting, and manipulating linked lists and trees.		
BIE-PA2.21 Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack,	queue, enlargeat	le array, list, set,
table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming	(e.g., template pro	gramming,
copying/moving of objects, operator overloading, inheritance, polymorphism).		
BIE-GIT.21 SW Development Technologies	Z	3
This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce studer	ts to Git, the infor	mation manager
from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use.		
BIE-TZP21 Technological Fundamentals of Computers	Z.ZK	5
Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how comput	er structures look	like at the lowest
level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to r	educe the consum	ption; what the
limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a	computer power s	upply looks like
(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.		
BIF-UOS 21 Unix-like Operating Systems	K7	5
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative	e functions of mult	iuser operating
systems for computers and their networks and clusters. The most popular OS today. Android, has a unix kernel. Students get overview of basic pror	erties of this OS f	amily, such as
processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the le	vel of advanced us	sers who are not
only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface	, called shell.	

Name of the block: Compulsory courses in the specialization Minimal number of credits of the block: 40 The role of the block: PS

Code of the group: BIE-PS-PV.21

Name of the group: Compulsory Courses of Specialization Computer Systems and Virtualization, version 2021

Requirement credits in the group: In this group you have to gain 40 credits

Requirement courses in the group: In this group you have to complete 8 courses

Credits in the group: 40

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-SPS.21	Administration of Computer Networks and Services Libor Dostálek, Jan Kubr Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	PS
BIE-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Pavel Tvrdík Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PS
BIE-ZSB.21	Basics of System Security Ji í Bu ek, Simona Forn sek, Marián Svetlík, Martin Šutovský Simona Forn sek Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	z	PS

Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)	Z,ZK	5	2P+2C	Z	PS
Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	PS
Unix Administration Zden k Muziká, Petr Zemánek Petr Zemánek (Gar.)	Z,ZK	5	2P+2C	L	PS
Virtualization and Data Centers Jií Kašpar Jií Kašpar Jií Kašpar (Gar.)	Z,ZK	5	2P+2C	L	PS
Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)	Z,ZK	5	2P+2C	Z	PS
	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.) Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.) Unix Administration Zden k Muziká, Petr Zemánek Petr Zemánek Petr Zemánek (Gar.) Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.) Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)Z,ZKSelected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)Z,ZKUnix Administration Zden k Muziká, Petr Zemánek Petr Zemánek Petr Zemánek (Gar.)Z,ZKVirtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)Z,ZKWeb and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)Z,ZK	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)Z,ZK5Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)Z,ZK5Unix Administration Zden k Muziká, Petr Zemánek Petr Zemánek Petr Zemánek (Gar.)Z,ZK5Virtualization and Data Centers Ji í Kašpar Ji í Kašpar (Gar.)Z,ZK5Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)Z,ZK5	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)Z,ZK52P+2CSelected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)Z,ZK52P+2CUnix Administration Zden k Muziká, Petr Zemánek Petr Zemánek Petr Zemánek (Gar.)Z,ZK52P+2CVirtualization and Data Centers Ji í Kašpar Ji í Kašpar (Gar.)Z,ZK52P+2CWeb and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)Z,ZK52P+2C	Introduction to DevOps Tomáš Vondra, Zden k Rybola, Jakub Jab rek Tomáš Vondra Zden k Rybola (Gar.)Z,ZK52P+2CZSelected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdík Mohamed Bettaz (Gar.)Z,ZK52P+2CLUnix Administration Zden k Muziká, Petr Zemánek Petr Zemánek Petr Zemánek (Gar.)Z,ZK52P+2CLVirtualization and Data Centers Ji í Kašpar Ji í Kašpar (Gar.)Z,ZK52P+2CLWeb and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)Z,ZK52P+2CZ

Characteristics of the courses of this group of Study Plan: Code=BIE-PS-PV.21 Name=Compulsory Courses of Specialization Computer Systems and Virtualization, version 2021

BIE-SPS.21 Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administr	ated under the or	perating systems
Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained	by practical hand	ls-on experience
with real network infrastructure.		
BIE-APS.21 Architectures of Computer Systems	Z,ZK	5
Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Sp	ecial emphasis is	given on the
pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the pipelined instruction processing and on the memory hierarchy.	principles of instru	ction processing
not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of	of the sequential n	nodel of the
program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory c	oherence and con	isistency in such
systems.		
BIE-ZSB.21 Basics of System Security	Z,ZK	5
The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of fore	nsic analysis and	related topics
such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of mod	dern operating sys	stems security,
as well as skills needed for independent work in the area of operating system security incident analysis.		
BIE-IDO.21 Introduction to DevOps	Z,ZK	5
The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of	systems and serv	ices. The course
covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and but	ilding and deploy	ing software to
the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquait	nted with modern	technologies
used in practice.		
BIE-VPS.21 Selected Topics in Computer Networking	Z,ZK	5
The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and tech	nologies used in m	odern computer
networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practi	cal experience wit	th real network
devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and securit	iy.	
BIE-ADU.21 Unix Administration	Z,ZK	5
Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. T	hey will understan	d the differences
between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rigil	nts, file systems, d	lisk subsystems,
processes, memory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the k	nowledge from the	e lectures on
specific examples from practice.		
BIE-VDC.21 Virtualization and Data Centers	Z,ZK	5
The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design	and implementation	on of data center
infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data of	center technologie	s from private
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications	Students will un	derstand the
design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, out		
BIE-AWD 21 Web and Database Server Administration	iges, and data los	ses.
BIE / WB/21 WB/21 Balababb Borver / tanini Bration	iges, and data los	ses. 5
Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a	ages, and data los Z,ZK nd backup comple	ses. 5 ex database and
Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, a web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of	ages, and data los Z,ZK Ind backup comple a web server.	ses. 5 ex database and

Name of the block: Elective vocational courses in the branch/specialization Minimal number of credits of the block: 0 The role of the block: VO

Code of the group: BIE-PV-VO.21

Name of the group: Elective vocational Courses of the Specialization Computer Systems and Virtualization, ver. 2021

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-AG2	Algorithms and Graphs 2 Ond ej Suchý	Z,ZK	5	2P+2C	L	VO

BIE-TAB.21	Applications of Security in Technology Jan B lohoubek, Ji í Dostál, Maciej Skórski, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	vo
BIE-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, František Ková, Martin Šutovský Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z,L	VO
BIE-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-JPO	Computer Units Pavel Kubalík	Z,ZK	5	2P+2C	Z	vo
BIE-KOM	Conceptual Modelling Robert Pergl	Z,ZK	5	2P+2C	Z	VO
BIE-VES	Embedded Systems Miroslav Skrbek	Z,ZK	5	2P+2C	L	VO
BIE-EHA.21	Ethical Hacking Ji í Dostál, Andrej Šimko, Martin Kolárik Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-HWB	Hardware Security <i>Ji í Bu ek</i>	Z,ZK	5	2P+2C	Z	VO
BIE-IOT.21	Internet of Things Pavel Tvrdík, Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	Z	vo
BIE-UKB.21	Introduction to Cybersecurity Jan B lohoubek, Ivana Trummová, David Pokorný, Tomáš Rabas, Tomáš Lu ák Jan B lohoubek Jan B lohoubek (Gar.)	Z,ZK	5	3P+1C	z	VO
BIE-TJV.21	Java Technology Ond ej Rozinek Ond ej Rozinek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-LA2.21	Linear Algebra 2 Karel Klouda, Marzieh Forough Karel Klouda Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	VO
BIE-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-SIP.21	Network Programming Jan Fesl Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	VO
BIE-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-PNO	Practical Digital Design Martin Novotný Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	VO
BIE-PJP	Programming Languages and Compilers Jan Janoušek	Z,ZK	5	2P+1C	L	VO
BIE-PPA	Programming Paradigms Petr Máj	Z,ZK	5	2P+2C	Z	VO
BIE-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BIE-BEK	Secure Code Róbert Lórencz	Z,ZK	5	2P+2C	L	VO
BIE-SWI.21	Software Engineering Stanislav Kuznetsov, Zden k Rybola, Jakub Jab rek, Ond ej Rozinek Zden k Rybola Zden k Rybola (Gar.)	Z,ZK	5	2P+1C	L	VO
BIE-SP1.21	Team Software Project 1 Stanislav Kuznetsov, Zden k Rybola, Jakub Jab rek, Ond ej Rozinek Zden k Rybola Zden k Rybola (Gar.)	KZ	5	4C	L	vo
BIE-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Zden k Rybola Zden k Rybola (Gar.)	KZ	5	2C	z	VO

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-VO.21 Name=Elective vocational Courses of the Specialization Computer Systems and Virtualization, ver. 2021

BIE-AG2	Algorithms and Graphs 2	Z,ZK	5				
BIE-TAB.21	Applications of Security in Technology	Z,ZK	5				
The goal of the course is to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Students get a broader overview of							
cybersecurity applicatio	ns and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.						
BIE-ASB.21	Applied Network Security	Z,ZK	5				
The aim of the course is	to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge ga	ined in course BI	-PSI with actual				
security applications like	e the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishin	ng the course stu	dent will get				
knowledge of security a	pplications in computer networks.						
BIE-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5				
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state							
space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will							
be presented as well.	be presented as well.						

	Z,ZK	5
The course gives an introduction to the field of automatic control. It focuses particularly on the control of engineering and physical systems. It cover	rs basic knowledge	of the feedback
control of linear dynamical single-input-single-output systems. Students will learn the methods of creating descriptions of system models, basic linear dynamical single-input-single-output systems.	ear dynamic systen	ns analysis, and
design and verification of simple feedback PID, PSD, and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues	of stability of contro	l systems, single
and continuous adjustment of the controller parameters, and certain aspects of the industrial implementations of continuous and digital controllers		
BIE-TPS.21 Computer Networks Technologies	Z,ZK	5
The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the pl	ysical layer with the	overlap to the
link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective te	chnologies will be de	emonstrated and
with the most important ones students will get hands-on experience. I hematically, the course covers both local and long-range optical networks, if always with focus on high-speed petworks.	thernet, modern wi	reless networks,
	7.71	F
DIE-JFO COMPUTER OTHERS Students know the internal structure and organization of computer or processor components and their interfacing with the environment. They und	$ \mathcal{L}, \mathcal{L}\mathbf{R}$	J tion of main
memory and other internal memories (addressable LIEO EIEO and CAM) They know the organization of an arithmetic unit They learn the design	methodology for c	ontrol units and
controllers, as well as basic principles of communication with peripheral devices and buses. They understand the architecture of a bus system.	The housingy for c	
BIE-KOM Conceptual Modelling	7 7K	5
The course focuses on the development of abstract thinking skills and precise specifications in the form of conceptual models. Students will learn t	he ability to distingu	sh kev concepts
in the domain, categorize and also determine the right links in complex systems of social reality, especially enterprises and institutions. Students	vill learn the basics	of ontological
structural modeling in OntoUML notation. They will also learn to express the rules and limitations of everyday reality using the OCL language. Stu	lents will also learn	the basics of
Enterprise Engineering as a discipline enabling conceptual modeling of the structure of enterprises and institutions and their process and learn th	e DEMO methodolo	gy. The course is
also designed with regard to the continuity of software implementations.		
BIE-VES Embedded Systems	Z,ZK	5
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and er	nbedded processors	, their integrated
peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.		
BIE-EHA.21 Ethical Hacking	Z,ZK	5
The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats,	vulnerabilities, and t	heir possible
exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The foc	us is on hands-on e	xperience with
vulnerabilities testing and the following process of penetration test documentation.		
BIE-HWB Hardware Security	Z,ZK	5
The course deals with hardware resources used to ensure security of computer systems including embedded ones. The students become familia	with the operating	principles of
cryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge a	out vulnerabilities c	f HW resources,
including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart c	ard technology inclu	ding applications
and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of ciphers.		
BIE-IOT.21 Internet of Things	Z,ZK	5
The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to a	n overview of senso	rs and actuators,
wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT ar	chitectures for differ	ent application
areas. Within the computer labs, students will gain practical experience with developing simple to I systems using common development environn	ents (hardware - Ar	RM, ESP, STM;
Software - Arduino, Raspberry PLOS).	7 71/	-
BIE-UKB.21 Introduction to Cybersecurity	Z,ZK	5
I he goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basi	c overview of threats	s in cyberspace
and anacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.	7 71/	-
BIE-IJV.21 Java Technology	Z,ZK	5
I he aim of the course is to provide knowledge and skills needed for the development of smaller and larger information systems. Students will get	acquainted with gen	eral theoretical
-1.4 M A	to the course since	
concepts and win be able to apply insee concepts using inbrares and tools norm the cosystem of the sava programming language. Aller complete	ore used and not to	his will be able
to participate in the development of software systems on the Java platform. Students are assumed to be acquainted with the following topics (they course): lava language systems on the Java platform. Students are assumed to be acquainted with the following topics (they course): lava language systems on the Java platform.	are used and not ta	aught in this
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BIE-PJP	Programming Languages and Compilers	Z,ZK	5			
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts						
for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target						
form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs						
for parsing and processing text in a language defined by a LL(1) grammar.						
BIE-PPA	Programming Paradigms	Z,ZK	5			
BIE-SRC.21	Real-time systems	Z,ZK	5			
Students obtain the bas	ic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issue	es. Theoretical kn	owledge from			
lectures will be experim	entally verified in department specialized labs. The course is mainly focused on embedded RT systems, therefore the design	kits in the lab are	the same as in			
the BIE-VES course an	d FPGAs.					
BIE-BEK	Secure Code	Z,ZK	5			
The students will learn h	now to assess security risks and how to take them into account in the design phase of their own code and solutions. After gettin	g familiar with the	threat modeling			
theory, students gain pr	actical experience with running programs with reduced privileges and methods of specifying these privileges, since not every	program needs t	o run with			
administrator privileges	Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securin	g data and the re	lationships of			
security and database s	systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the o	defense against tl	nem.			
BIE-SWI.21	Software Engineering	Z,ZK	5			
Students get acquainte	d with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	consolidate and	practically verify			
their knowledge during	the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hand	ds-on experience	with CASE tools			
using the visual language	ge UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig	n and testing. Wit	hin the course,			
students also gain a the	poretical basis in the field of project management, estimation of costs of software projects, and methods of their development.					
BIE-SP1.21	Team Software Project 1	KZ	5			
Students gain hands-or	experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the	e BIE-SWI course	e that runs			
concurrently and that te	aches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The tea	acher, in the role	of the team and			
project leader, regularly	consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	artefact will be fu	rther developed			
and finished in the BIE-SP2 course.						
BIE-SP2.21	Team Software Project 2	KZ	5			
Students gain hands-or	experience with the iterative development process while working on a large-scale software project. The first iteration is the res	sult of the BIE-SP	1 course project.			
However, in this follow-up, the functionality, testing, and documentation of the software system being developed will be emphasized. Students will work in teams of 4-6 people. The						
teacher, in the role of th	e team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspects of their se	olution.				

Name of the block: Compulsory elective courses Minimal number of credits of the block: 5 The role of the block: PV

Code of the group: BIE-PV-PV.21

Name of the group: Compulsory elective Courses of specialization Computer Systems and Virtualization, version 2021

Requirement credits in the group: In this group you have to gain at least 5 credits (at most 15) Requirement courses in the group: In this group you have to complete at least 1 course (at most 3) Credits in the group: 5

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BIE-TAB.21	Applications of Security in Technology Jan B lohoubek, Ji í Dostál, Maciej Skórski, Martin Pozd na Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	PV
BIE-BIG.21	DB Technologies for Big Data Josef Gattermayer	KZ	5	2P+2C	L	PV
BIE-VES	Embedded Systems Miroslav Skrbek	Z,ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=BIE-PV-PV.21 Name=Compulsory elective Courses of specialization Computer Systems and Virtualization, version 2021

BIE-TAB.21	Applications of Security in Technology	Z,ZK	5
The goal of the course	s to introduce students to selected topics from cybersecurity technical applications that are utilized in different industries. Stu	dents get a broad	der overview of
cybersecurity application	ns and extend their knowledge from the cryptology, the secure code, and system, network, and hardware security.		
BIE-VES	Embedded Systems	Z,ZK	5
Students learn to desigr	embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and emb	edded processors	s, their integrated
peripheral circuits, prog	ramming methods, and applications. They get practical skills with development kits and tools.		
BIE-BIG.21	DB Technologies for Big Data	KZ	5
Students will be introdu	ced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course	is focused practic	cally so that after
finishing the course stu	dents were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible	method of data p	processing (data
collection, transformation	n/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theor	etical foundation a	and presentation
of individual technologie	es will be supplemented with specific case studies.		

Name of the block: Elective courses Minimal number of credits of the block: 0

Code of the group: BIE-V.2021 Name of the group: Purely Elective Bachelor Courses, Version 2021 till 2024/25 Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)					
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V
BIE-ZRS	Basics of Systems Control Kate ina Hyniová	Z,ZK	4	2P+2C	L	V
BIE-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BIE-SCE1	Computer Engineering Seminar I Hana Kubátová, Miroslav Skrbek Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	Z	V
BIE-SCE2	Computer Engineering Seminar II Hana Kubátová, Ji í Vysko il Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L	V
BIE-CZ0	Czech Language for Foreigners Tomáš Houdek, Markéta Hofmannová, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	ΚZ	2	4C	Z,L	V
BIE-CZ1.21	Czech Language for Foreigners II Tomáš Houdek, Ivana Vondrá ková, Petra Korfová Zden k Muziká Zden k Muziká (Gar.)	КZ	2	4C	Z,L	V
UKCJP	Czech language for advanced Tomáš Houdek, Jakub Šenovský, Jakub Šolc, Adam Vostárek Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	2	2BP+2BC	Z,L	V
BIE-DIF	Differential equations Antonella Marchesiello, Ond ej Bouchala, Jan Valdman Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-EPR	Economic project Tomáš Evan Tomáš Evan (Gar.)	Z	1		L	V
BIE-FTR.1	Financial Markets Pavla Vozárová	Z,ZK	5	2P+2C	L	V
BIE-HAS	Human Factors in Cryptography and Security Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
BIE-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	L	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-IMA	Introduction to Mathematics Karel Klouda	Z	4	3C	Z	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BIE-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BIE-OOP	Object-Oriented Programming <i>Filip K ikava</i>	Z,ZK	4	2P+2C	Z	V
BIE-PKM	Preparatory Mathematics Jitka Rybní ková Tomáš Kalvoda (Gar.)	Z	4		Z	V
BIE-PJV	Programming in Java Jan Blizni enko Jan Blizni enko Jan Blizni enko (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-PS2	Programming in shell 2 <i>Lukáš Ba inka</i>	Z,ZK	4	2P+2C	L	V
BIE-PRR.21	Project management David Pešek David Pešek David Pešek (Gar.)	Z,ZK	5	2P+2C	Z,L	V
BIE-SKJ.21	Scripting Languages Jan Ž árek, Lukáš Ba inka Lukáš Ba inka Jan Ž árek (Gar.)	Z,ZK	4	2P+2C	L	V
BIE-VAK.21	Selected Combinatorics Applications Michal Opler, Dušan Knop Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BIE-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
BI-SCE1	Computer Engineering Seminar I Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BIE-SEG	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V

TVV	Physical education	Z	0	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V
TV2K1	Physical Education 2	Z	1		L,Z	V
TVKLV	Physical Education Course	Z	0	7dní	L	V
BIE-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	V
BIE-VR1.21	Virtual reality I Petr Klán Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BIE-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
FITE-SEP	World Economy and Business Tomáš Evan	Z,ZK	4	2P+2C	Z	V
BIE-SEP	World Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	Z	V
BIE-3DT.1	3D Printing Marek Žehra	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BIE-V.2021 Name=Purely Elective Bachelor Courses, Version 2021 till 2024/25

DIE ZI IM Artificial Intelligence Eurodementale	7.71/	1
DIE-2011 A Unicial interligence Fundamentals		4
Students are introduced to the fundamental problems in the Artificial intelligence, and the basic methods for their solving, it focuses mainly on the	classical tasks from t	ne areas of state
space search, multi-agent systems, game theory, planning, and machine learning. Modern sort-computing methods, including the evolutionary a	gorithms and the neu	rai networks, will
De presented as weil.		
BIE-2RS Basics of Systems Control	Z,ZK	4
Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction	n to the field of autom	atic control will
be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We was	Il focus our attention	particularly on
control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We	will teach you descrip	tion methods of
system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey	course in which stude	ents will learn the
methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback	k, PSD and fuzzy con	trollers. Attention
is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller p	arameters and certai	n aspects of the
industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful	examples and practic	al industrial
implementations.		
BIE-CCN Compiler Construction	Z,ZK	5
This is an introductory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principle of the class is to introduce basic principle of the class is the principle of the class of the class is the principle of the class of the c	iples of compilers for	students to
understand the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching the	eme of the class.	
BIE-SCE1 Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resi	tance to failures and a	attacks. Students
are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Pa	t of the subject is wor	k with scientific
articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminai	teachers. The topics	are new for each
semester.		
BIE-SCE2 Computer Engineering Seminar II	7	1
The Seminar of Computer Engineering Comments for students who want to deal with deeper topics of digital design reliability and resi	tance to failures and :	attacks Students
The dominant of dominated Engineering is a (opticative ordered or aroun of students solves some interesting tools), within the subject Each students or aroun of students solves some interesting tools with the solvested engineering tools and the solvest solution to the solvest solve	t of the subject is wor	k with scientific
are approximate including within the subject. Each student of group of students softes softe microsing topic with the selected subjection. Fa	teachers The tonics	are new for each
consistent of the processional includes and/or work in the traditiones. The subject is infined by the possibilities of the seminar	teachers. The topics	
BIE CZO	V7	2
DIE-CZU CZECH Language for Foreigners	NZ	2
Course Czeci nor integrates the basic topics of conversation, introductions, Orientation, Shopping, work/ Study, navel, nine, Panny.		
BIE-C21.21 Czech Language for Foreigners II	KZ	2
The course is intended for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech languation of the course of	ge. The course furthe	er expands the
basic vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the Czech	Republic.	
UKCJP Czech language for advanced	Z,ZK	2
An advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with validity for C	U.	
BIE-DIF Differential equations	Z,ZK	5
This course provides a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to est	ential solution method	s like separation
of variables. Key theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are cover	red with methods like	characteristic
polynomial analysis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world app	cations. Finally, an in	troduction to
partial differential equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving	ODEs and PDEs, inc	luding implicit
and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-EPR Economic project		4
This course is an extension of the course Introduction to European Economic History (RIE-EHD). There is no fived schedule for RIE-EPR A tea	7	1
	ber will contact you b	efore the start of
the semester.	Z her will contact you b	efore the start of
the semester. IIIE_ETP 1 Financial Markets	Definition of the second secon	efore the start of
the semester. BIE-FTR.1 Financial Markets	Z her will contact you b	1 efore the start of 5 dit rick, and
the semester. BIE-FTR.1 Financial Markets Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of structured financial products, a new point of via development of via develo	Z ther will contact you b Z,ZK w on the issue of cre	1 efore the start of 5 dit risk, and
the semester. BIE-FTR.1 Financial Markets Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of vir globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time as understanding of the functional schools who have sufficient knowledge ICT and mathematics.	Z her will contact you b Z,ZK w on the issue of cre activities, many firms	1 efore the start of 5 dit risk, and need graduates
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This is an introductory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in	<u> </u>	∠
This data mission and the contraction of the provided and the data to understand the check of the provided the mission of a matter and the data to the provided the mission of a matter and the data to the data to the second the data to the second to the s	other fields but intere	sted in computer
science, nigh-school students, anybody with a background in basic math and the desire to understand the absolute basics of computer science for students to understand, early on, what computer science is, why things such as high-level prices of computer science for students to understand, early on, what computer science is, why things such as high-level prices of computer science for students to understand, early on, what computer science is, why things such as high-level prices of computer science is why things such as high-level prices.	orramming language	s and tools are
done the way they are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to ans	wer not just basic cor	nputer science
questions but also questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are	interested in comput	er science more
than expected, or even less than before.		
BIE-EHD Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the glob	cal economy through	the description
or the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the eco	nomic history. From is	arge economic
does not cover detailed economic history of particular European countries but rather the impact of trade and role of particular events institutions	and organizations in	history Class
meetings will consist of a mixture of lecture and discussion.	<u>.</u>	, , , , , , , , , , , , , , , , , , , ,
FITE-EHD Introduction to European Economic History	Z,ZK	3
The course introduces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the glob	bal economy through	the description
of the key periods in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the eco	nomic history. From la	arge economic
area of Roman Empire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial	institutions is deciphe	ered. The course
meetings will consist of a mixture of lecture and discussion	and organizations in	nistory. Class
BIF-IMA Introduction to Mathematics	7	4
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and the	ey are able to apply the	nem in particular
examples.		·
BIE-IMA2 Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and the	ey are able to apply the	nem in particular
examples.		1
BIE-ST1 Network Technology 1	Z	3
The course is focused on essentials of computer networks and practice with network technologies. The course corresponds to the Cisco Netaca	d curriculum, CCNA1	- R&S
BIE-OOP Object-Oriented Programming	7.7K	1
Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate to	ether by message pr	assing. In this
course we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software	development includir	ig testing, error
handing, refactoring and design patterns.		
BIE-PKM Preparatory Mathematics	Z	4
The purpose of Preparatory Mathematics is to help students revise the most important topics of high-school mathematics.		
BIE-PJV Programming in Java	Z,ZK	4
The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of	Java language the fu	ndamental APIs
Will also be presented, especially data structures, files, GUI, networking, databases and concurrent APIs.	7 71/	4
DIE-PS2 PloyIdITITITINI III STIELI Z Students get a general overview of scripting languages introduction into syntax, semantics, programming style, data structures, pros and cons	In addition, they gain	a deeper insidet
into Bourne Again shell and some other particular scripting languages and will get practical experience with shell script programming. Note to Era-	in addition, they gain	a accper margin
	smus students: We are	e ready do adapt
the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools	smus students: We ar (cp, In, mkdir, rm) a	e ready do adapt nd useful basic
the lectures to provide even very basic Bourne shell usage. Depending on actual knowledge of the students, orientation in user filesystem tools data filtering tools (cut, tr, sort, uniq) can be provided. The advantage of this module is that we do not stop at this point - we will show you also	smus students: We ar (cp, In, mkdir, rm) a a selection of advanc	e ready do adapt nd useful basic æd scripting
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BIE-SEG	Systems Engineering	7	0
This is an introductory of	lass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	of operating syste	ems for students
to understand processo	r and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taki	ng the class, stud	ents are able to
understand the differen	ce between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co	ncurrency is, as o	pposed to
parallelism, and how pro	presses and threads synchronize efficiently to overcome concurrency for communication.	-	
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV2K1	Physical Education 2	Z	1
TVKLV	Physical Education Course	Z	0
BIE-TUR.21	User Interface Design	Z,ZK	5
Students gain a basic o	verview of methods for designing and testing common user interfaces. They get experience to solve the problems where soft	ware and other pr	oducts do not
communicate with the u	ser optimally, since the needs and characteristics of users are not taken into account during product development. Students	gain an overview	of methods that
bring users into the dev	elopment process to ensure optimal interface for them.		
BIE-VR1.21	Virtual reality I	KZ	4
Introduction to Virtual R	eality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The	course focuses of	n the ways of
creating virtual reality w	orlds and interactive activities in 3D worlds. It improves computational thinking, empathy, and shared social activities.		
BIE-ADW.1	Windows Administration	Z,ZK	4
Students understand th	e architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the	standard admini	stration and
security tools and apply	advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adn	ninistrate
heterogeneous systems	s. Students are able to effectively configure centralised administration of a computer network.		
FITE-SEP	World Economy and Business	Z,ZK	4
The course introduces s	students of technical university to the international business. It does that predominantly by comparing individual countries and	l key regions of w	orld economy.
Students get to know at	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor	n, corruption and	economic
development, which are	needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on in	dividual readings	It is advised to
take bachelor level of th	is course BIE-SEP as a prerequisite.		
BIE-SEP	World Economy and Business	Z,ZK	4
The course introduces s	students of technical university to the international business. It does that predominantly by comparing individual countries and	key regions of w	orld economy.
Students get to know at	bout different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedor	n, corruption and	economic
development, which are	needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on in	dividual readings	It is advised to
take bachelor level of th	is course BIE-SEP as a prerequisite.		
BIE-3DT.1	3D Printing	KZ	4
Students learn to design	n three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design object	cts, prepare for pr	inting and print
in 3D.			

List of courses of this pass:

Code	Name of the course	Completion	Credits	
BI-SCE1	Computer Engineering Seminar I	Z	4	
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each				
	semester.			
BIE-3DT.1	3D Printing	KZ	4	
Students learn to o	design three-dimensional objects optimized for printing on a RepRap printer and the printing itself. They will be able to design objects in 3D.	, prepare for printi	ng and print	
BIE-AAG.21	Automata and Grammars	Z,ZK	5	
Students are introd	luced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite	automata, regular	expressions	
and regular gramm Knowledge acqui	ars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, relationships between fo red through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation,	rmal languages an and design of digi	d automata. tal circuits.	
BIE-ADU.21	Unix Administration	Z.ZK	5	
Students will learn	the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They	will understand the	differences	
between user and	administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights,	file systems, disk	subsystems,	
processes, memo	bry, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the known	owledge from the I	ectures on	
	specific examples from practice.			
BIE-ADW.1	Windows Administration	Z,ZK	4	
Students unders	tand the architecture and internals of the Windows OS and acquire the skills to administrate the Windows OS. They are able use the	standard administ	ation and	
security tools a	nd apply advanced ActiveDirectory administration methods. They are able to solve problems by applying appropriate troubleshooting	methods and adm	inistrate	
	heterogeneous systems. Students are able to effectively configure centralised administration of a computer network.			
BIE-AG1.21	Algorithms and Graphs 1	Z,ZK	5	
The course cover	s the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computi	ng curriculum. It is	interlinked	
with the concurrent	BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of practically the asymptotic mathematics.	algorithms and lea	rn to handle	
BIE-AG2	Algorithms and Graphs 2	Z,ZK	5	
BIE-APS.21	Architectures of Computer Systems	Z,ZK	5	
Students will lear	n the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec	cial emphasis is giv	ven on the	
pipelined instructio	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the prin	ciples of instruction	n processing	

not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such

program. The cours	se furmer elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cone systems.	Tence and consiste	incy in Such
BIE-ASB.21	Applied Network Security	Z.7K	5
The aim of the cou	rrse is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gaine	d in course BI-PSI	with actual
security applicati	ions like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing knowledge of security applications in computer networks.	g the course studer	nt will get
BIE-AWD.21	Web and Database Server Administration	Z,ZK	5
Students will get ac	equainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and	backup complex da	tabase and
web serv	ice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an exam	ple of a web serve	er.
BIE-BAP.21	Bachelor Thesis	Z	14
BIE-BEK	Secure Code	Z,ZK	5 at modaling
theory students	an now to assess security risks and now to take them into account in the design phase of their own code and solutions. After getting ra-	program needs to	run with
administrator priv	ileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing	data and the relation	onships of
security and	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the	e defense against	them.
BIE-BIG.21	DB Technologies for Big Data	KZ	5
Students will be int	roduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is for	ocused practically	so that after
collection transform	e students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible me mation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretic	inod of data proce	ssing (data
	of individual technologies will be supplemented with specific case studies.	a louidation and p	resentation
BIE-BPR.21	Bachelor Project	Z	1
At the beginning of	of the semester the student will contact the supervisor of the bachelor thesis he has booked. They will discuss the partial tasks that st	udent will perform	during the
	semester. If he fulfill these tasks, the supervisor will award him / her at the end of the semester with the BI-BPR course.		
BIE-CCN	Compiler Construction	Z,ZK	5
This is an introdu	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	of compilers for stu	udents to
	Ind the design and implementation of programming languages. Seeing and actually understanding self-complication is the overarching		5. O
DIE-COI	Infloduction to Computer Science for broad audiences: backelor students in computer science, students majoring in other fir	∣ ∠ ∠ elds but interested	∠ in computer
science, high-scho	bol students, anybody with a background in basic math and the desire to understand the absolute basics of computer science. The go	bal of the class is to	o introduce
and relate basic p	rinciples of computer science for students to understand, early on, what computer science is, why things such as high-level programmer	ning languages an	d tools are
done the way they	are, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no	t just basic comput	er science
questions but also	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interes	ted in computer sc	ience more
BIE-CZ0	Czech Language for Foreigners	K7	2
	Course Czech for foreigners offers the basic topics of conversation: Introductions, Orientation, Shopping, Work / Study, Travel, Time	ə, Family.	-
BIE-CZ1.21	Czech Language for Foreigners II	KZ	2
The course is inte	nded for Students of English programmes who have completed BIE-CZ0 course or have basic knowledge of the Czech language. The	e course further ex	pands the
basic	vocabulary and clarifies the structure of the Czech language structure with regard to the practical needs of Students residing in the	Czech Republic.	
BIE-DBS.21	Database Systems	Z,ZK	5
Students get acqu	ainted with the architecture of the database engine and typical user roles. They learn to design the structure of a smaller data store (i model and then implement them in a relational database engine. They get acquisited with the SOL language and also with its theoret	ical basis - relation	al database
model. They will ge	et acquainted with the principles of relational database schema normalization. They understand the basic concepts of transaction pro	cessing and control	l of parallel
, ,	user access to a single data source. At the end of the course, students will be introduced to alternative nonrelational database m	nodels.	
BIE-DIF	Differential equations	Z,ZK	5
This course provide	es a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential so	olution methods like	separation
of variables. Key t	heorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered with the followed by examples of non-linear models are covered with the followed by examples of no	h methods like cha	aracteristic
porynomial analy	equations (PDFs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODFs	and PDFs includi	na implicit
F	and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.		
BIE-DML.21	Discrete Mathematics and Logic	Z,ZK	5
Students will get ad	equainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts for	m set theory will be	explained.
Special attention is	paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course	e also lays down th	ne basics of
	combinatorics and number theory, with emphasis on modular arithmetics.	7	
BIE-EEC	English language external certificate the submission of a certificate certificate that demonstrates their proficiency in English	j Z sh.comparable to o	4 r exceeding
	the B2 level of the Common European Framework of Reference for Languages.	sil comparable to o	rexceeding
BIE-EHA.21	Ethical Hacking	Z.ZK	5
The goal of the c	purse is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln	erabilities, and thei	r possible
exploitation in com	nputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is	on hands-on exper	rience with
	vulnerabilities testing and the following process of penetration test documentation.	¹	
BIE-EHD	Introduction to European Economic History	Z,ZK	3
of the key periods	uces a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global eco- in history. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	history From large	
area of Roman Em	pire to fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial instituti	ons is deciphered.	The course
does not cover de	tailed economic history of particular European countries but rather the impact of trade and role of particular events, institutions and c	rganizations in his	tory. Class
	meetings will consist of a mixture of lecture and discussion.		
BIE-EPR	Economic project	Z	1
This course is an e	xtension of the course Introduction to European Economic History (BIE-EHD). There is no fixed schedule for BIE-EPR. A teacher will	contact you before	the start of
	the semester.		

	Z,ZK	5
Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view o	n the issue of credit	risk, and
globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activiti	ies, many firms need	d graduates
from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of fi	nancial markets. The	e Financial
Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statist	ical tools used in this	s field.
BIE-GIT.21 SW Development Technologies	Z	3
This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students	to Git, the informatio	on manager
from heil, as Linus forvalds hicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day us		
BIE-HAS Human Factors in Cryptography and Security	Z,ZK	5
I his course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for develope	rs. Students of this c	course can
DIE LIMP	771/	F
DIE-TIVVD The course deals with hardware resources used to appure socurity of computer systems including embedded once. The students become familiar w	Z,ZN	D Docinios of
cryptographic modules, the security features of modern processors, and storage media protection through encryption. They will gain knowledge about t	ulperabilities of HW	
including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card te	chnology including a	applications
and related topics for multi-factor authentication (biometrics). Students will understand the problems of effective implementation of	of ciphers.	applicationic
BIF-IDO 21 Introduction to DevOps	7.7K	5
The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systems	stems and services.	The course
covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and built the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquain used in practice.	ding and deploying s ited with modern tec	software to hnologies
BIF-IMA Introduction to Mathematics	7	4
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are examples.	able to apply them in	n particular
BIE-IMA2 Introduction to Mathematics 2 Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are	Z able to apply them in	2 n particular
BIE-IOI.21 Internet of Things	Z,ZK	5
I he course focuses on an overview of technologies and development tools used in the field of the internet of I hings (Io I). Lectures are devoted to an overview of IoT architectures are devoted to an overview of IoT archi	erview of sensors and	d actuators,
areas Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environment	s (bardware - ARM F	ESP STM
software - Arduino Rasoberry Pi OS)		
BIE- IPO Computer Units	7 7K	5
Students know the internal structure and organization of computer or processor components and their interfacing with the environment. They unders	tand the organization	n of main
memory and other internal memories (addressable, LIFO, FIFO and CAM). They know the organization of an arithmetic unit. They learn the design me	thodology for contro	ol units and
controllers, as well as basic principles of communication with peripheral devices and buses. They understand the architecture of a	ous system.	
BIE-KAB.21 Cryptography and Security	Z,ZK	5
BIE-KAB.21 Cryptography and Security Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to	Z,ZK	5 keys and
BIE-KAB.21 Cryptography and Security Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in app	Z,ZK o use cryptographic blications. Within labs	5 keys and s, students
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theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and He	essian matrix, we s	study the
analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integra	ation of multivariate	e functions.
BIE-MPP.21 Methods of Interfacing peripheral devices The course is focured on methods for interfacing of peripheral devices is focured on techniques based on Universal		5 The course
includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB	devices. Linux and	d Windows
drivers, simple application development, and APIs of selected devices.		
BIE-OOP Object-Oriented Programming	Z,ZK	4
Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together h	by message passir	ng. In this
course we look at some of the main principles of object-oriented programming and design. The emphasis is on practical techniques for software develop handing, refactoring and design patterns	ment including tes	sting, error
BIE-OOP21 Object-Oriented Programming	7 7K	5
Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together b	by message passir	ng. In this
course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The empha	asis is on practical	techniques
for developing software, which includes testing, error handing, refactoring, and application of design pattern.		
BIE-OSY.21 Operating Systems	Z,ZK	5
In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread impl	ementations, race	conditions,
critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitor and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris Linux, or MS Wir	oring. They are abl	e to design
BIF-PA1 21 Programming and Algorithmics 1	7 7K	7
Students learn to construct algorithms for solving basic problems and write them in the C language. They master data types (simple, pointers, structure)	d), expressions, sta	atements,
and functions presented in C language. They understand the principle of recursion and basics of algorithm complexity analysis. They know fundamenta	al algorithms for se	earching,
sorting, and manipulating linked lists and trees.		
BIE-PA2.21 Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queu	ue, enlargeable arr	ay, list, set,
table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e.	g., template progra	amming,
BIE-D ID Programming Languages and Compilers	7.7K	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation	∣ ∠,∠r on of individual con	npiler parts
for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has	a certain syntax in	to a target
form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but	extends to all othe	r programs
for parsing and processing text in a language defined by a LL(1) grammar.		
BIE-PJV Programming in Java	Z,ZK	4
The course Programming in Java will introduce students to the object oriented programming in Java programming language. Beside of basics of Java lan	iguage the fundam	nental APIs
Will also be presented, especially data structures, files, GOI, networking, databases and concurrent APIs.	7	4
DIE-PININ Preparatory Mathematics is to be students revise the most important topics of high-school mathematics	Ζ	4
BIE-PNO Practical Digital Design	KZ	5
BIE-PNO Practical Digital Design Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the b	KZ asics of the VHDL	5 . language,
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articles and other professional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each

semester.		
BIE-SEG Systems Engineering	Z	0
This is an introductory class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles	of operating systems	for students
to understand processor and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After takin understand the difference between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what	ig the class, students	are able to
parallelism, and how processes and threads as well as emilation and withdalization, what which memory is and now it works, what parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-SEP World Economy and Business	Z.ZK	4
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries an	d key regions of world	l economy.
Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic free	lom, corruption and e	conomic
development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on in	dividual readings. It is	advised to
PIE SID 21	7	5
The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming	←	ockets. The
second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middle	ware technologies. Th	ne final part
introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in	computer labs using	a chosen
programming language environment.		
BIE-SKJ.21 Scripting Languages		4 Inle of other
standard text processing utilities (AWK, sed) with some basic UNIX system tools, in many real-world situations like processing web feeds or logs. W	aius, as well as a cou e will provide a gener	al overview
of scripting languages and introduction into their pros and cons and students get practical experience with shell script programming. We will touch al	so ROFF, PerlDoc, an	d even TeX
o get some insight into how your code documentation can be implemented. And if you know UNIX system-level scripting already, we can show you ac	vanced programming	techniques
and tricks that get overlooked frequently but increase code robustness or execution efficiency. The course is led by two veteran programmers in the scr	ipting world. Lukáš is	a renowned
lecturer in advanced shell programming, teaching developers from the IT industry in several CE countries. Jan is a skilled lecturer and developer whe	ose code contributes	to safe and
BIE-SD1 21	K7	5
Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in	the BIE-SWI course t	that runs
concurrently and that teaches students necessary techniques and principles. Teams consisting of 4-6 students will work on a specific project. The tea	cher, in the role of th	e team and
project leader, regularly consults with the team (at the seminars) both the formal and material aspects of the software design. The resulting software	artefact will be furthe	r developed
and finished in the BIE-SP2 course.		
BIE-SP2.21 Team Software Project 2	KZ KZ	5
However in this follow-up the functionality testing, and documentation of the software system being developed will be emphasized. Students will we	ork in teams of 4-6 pe	eople The
teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) the formal as well as material aspe	cts of their solution.	
BIE-SPS.21 Administration of Computer Networks and Services	Z,ZK	5
The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administration	ted under the operation	ing systems
inux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained	by practical hands-on	experience
Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained with real network infrastructure.	by practical hands-on	experience
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Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the low				
level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the				
limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like				
(in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica.				
BIE-UKB.21 Introduction to Cybersecurity Z,ZK 5				
The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspan				
and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations.				
BIE-UOS.21 Unix-like Operating Systems KZ 5				
Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovative functions of multiuser operating systems for computers efficient innovat				
systems to computers and their networks and closers. The most popular OS today, Android, has a unix kerner. Students get overview or basic properties of this OS family, such as				
only able to utilize powerful system tools that are available to users but are also able to automatize routine agenda using the unix scripting interface called shell				
BIF-VAK 21 Selected Combinatorics Applications 7 3				
The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach to				
issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore,				
with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we				
will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will				
also try to implement solutions to the studied problems with a special focus on the effective use of existing tools.				
BIE-VDC.21 Virtualization and Data Centers Z,ZK 5				
The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data cen				
infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from privation				
to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the				
design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.				
BIE-VES Embedded Systems Z,ZK 5				
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrat				
peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.				
BIE-VMM Selected Mathematical Methods Z,ZK 4				
The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and the				
properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine				
the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.				
BIE-VPS.21 Selected Topics in Computer Networking Z,ZK 5				
The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technologies used in modern compu				
networks from local area networks up to internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real networks from the view site of functionality performance, and experience with real networks from the view site of functionality performance.				
devices in the lab and learning important methods or local area and wide area networks from the viewpoint or functionality, performance, and security.				
BIE-VR1.21 VITUAL REALITY I KZ 4				
Introduction to Virtual Reality (VR), virtual reality operations, metaverse, and creation. Rules and requirements for virtual worlds communication. The course focuses on the ways of a creating virtual reality worlds and interacting activities in 2D worlds. It improves computational thinking approximation of a creating virtual reality worlds and interacting activities in 2D worlds.				
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FITE-SEP	World Economy and Business	Z,ZK	4	
The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy.				
Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic				
development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to				
take bachelor level of this course BIE-SEP as a prerequisite.				
TV2K1	Physical Education 2	Z	1	
TVKLV	Physical Education Course	Z	0	
TVV	Physical education	Z	0	
TVV0	Physical education	Z	0	
UKCJP	Czech language for advanced	Z,ZK	2	
An advanced Czech course for Ukrainian students with refugee status. The exam will confirm knowledge of Czech at B2 level with validity for CTU.				

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-07-08, time 16:14.